Growth and electrochemical behaviour of self-organized TiO_2 nanotube arrays on Ti-6Al-7Nb

L. Mohan [a, b], C. Anandan [a] * and N. Rajendran [b] *

[a] *Surface Engineering Division, CSIR-National Aerospace Laboratories P.O.Box:1779, Old Airport Road, Bangalore, Karnataka, India*

[b] *Department of Chemistry, Anna University, Chennai, Tamilnadu, India*

Abstract

Titanium being bio-inert shows poor bone cell adhesion with an intervening fibrous capsule. It could be made bio- active by several methods including growing *in situ* TiO_2 layer on Ti-surface. In the present work, we investigate the formation of self-organized titanium oxide nanotube layers by anodic oxidation on titanium alloy Ti-6Al-7Nb in electrolyte solution containing HF and H_2SO_4. The anodized surface was characterized by micro-Raman, XRD and FESEM. The corrosion behavior of the treated and untreated samples was investigated through electrochemical impedance spectroscopy (EIS) and potentiodynamic polarization studies in simulated body fluid (Hanks' solution). The investigations show that the native oxide on the sample is replaced by self assembled nano array by anodisation. Corrosion resistance of the anodized sample is comparable with that of the untreated samples. Electrochemical impedance data of the substrate was fitted with two time constant equivalent circuit and that of anodized samples with three time constant equivalent circuit.

Keywords: anodic oxidation, nanotubes, TiO_2, corrosion, EIS

*Authors E-mail id:

mohanbioengineer@gmail.com

canandan@nal.res.in

nrajendran@annauniv.edu